Sand Bars on Intermittent Rivers—a New Method of Treatment, by W. H. Shields, B.Sc., M.I.C.E., M.I.E.A.

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In the south part of Western Australia most of the rain falls in three or four winter months, leaving eight or nine months of the year nearly rainless, with the result that the rivers become very feeble streams if not absolutely dry during the summer and, in many coastal areas, the sand driven by the prevailing currents or winds blocks the estuaries of rivers, and forms lakes cut off from the sea by sand dunes. Often clay and vegetable detritus accumulate in these lakes, making a valuable soil when the water is drained off.

The winter rains set the streams running, and if the estuary has been completely blocked the water spreads out and rises until it either filters through the sand or overtops the bar. In the latter case the water sweeps a gap in the bar that may remain open for months and sometimes is not closed in the succeeding dry season. When the mouth of the river is thus opened the land-water can escape at each low tide, and has never a higher dam than full tide (which seldom rises high during the summer) imposes, whereas the sand bar once formed may rise several feet above the usual tide mark.

Throughout the world many schemes have been devised to keep open rivers that are subject to the formation of bars of sand or shingle, the method employed depending on whether the river is navigable or not. At Fremantle the Swan River mouth is kept open for navigation by utilising the flushing effect of the lakes behind to produce sufficient scour through the narrowed entrance between the moles, to sweep away sand that may come round the ends.

Another type is the small river such as the one that discharges at Lockville near Wonnerup, about South Latitude 33° 30′ and East Longitude 115° 36′. Some years ago it was reported that the water in the inlet was drying up in the summer, with the result that the potato lands became too dry, and residents wanted the bar to be cut through to admit the sea water. The author recommended a culvert from the estuary to the sea under the bar to be carried out until its mouth was several feet above the level of the bottom. The shore did not seem to be advancing, and quite a small culvert would have admitted all the water necessary to keep the inlet supplied. However, this suggestion was not carried out.

At Grasmere, about South Latitude 35° and East Longitude 117° 40′, the conditions were rather different in that a considerable area of fertile cultivated land lay between high and low water, taking high water to mean the highest known tide, but above the ordinary summer tide level. The difference between high and low tide varies from about two feet in summer to a maximum of six feet in winter.

Quite large inlets exist at the head of a short outlet river of considerable size and depth, and into these inlets a number of large intermittent creeks discharge, besides a considerable stream of water perpetually running from the drains in the higher swamps.

The original settlers could dig drains that would keep the water-level in their swamps down, provided these drains could discharge at low tide. The sand bar, which is in this case wind-formed, however, held up the land waters, keeping the inlet too high for the drains from the lower swamps to discharge.

The Government put a row of flood-gates across the inland end of the outlet river, with the sill level, in round figures, about a foot above low water, expecting it to keep the bar open; later a portion of these gates was lowered until their sill was level with low water, spring tide. But still the bar formed, grew more formidable than ever, threatening to fill the outlet river right up to the flood-gates, and the advice of the author was sought.

Had it been possible to pour a fairly large and constant stream of water into the outlet river, between the flood-gates and the bar, there is no doubt that this water would have piled up in that confined area and breached the bar frequently, if it did not hold it continually open. The streams, however, do not run continuously and the drains, which do, carried during the summer far too little water for the purpose. It was also evident that the flap flood-gates which stopped any inward flow would stop all tidal scour up the inlet river, and thus the only available scour was that of the inland waters, which would have to remain impounded until sufficiently high to breach the bar either by overtopping it, or, if nearly at this height, by artificial excavation.

As constant a scour as possible had to be encouraged if the river, which was pretty deep, was to be kept open. The only flow, on a large scale, procurable for a great portion of the year came from the tides, so that it was clear from the first that the removal of the flood-gates was necessary.

The next question was how to maintain a constant opening in the bar so that land-water from the drains might escape at every low tide. During the summer a comparatively small culvert would take the drain waters, but it would require a large one to accommodate the early and late flows caused by sudden heavy showers, and a very big and expensive one to take all the winter flow.

In his experience in railway washaways the author had noticed that many of these took place without the bank being overtopped, apparently the eddies formed near the mouth of the culvert being sufficient to wash away the material forming the embankment until the culvert was left unsupported and water ran outside of it, enlarging the gap. Also on Indian rivers, the increased rush of water through the bridges, due to confinement of the flood-waters by the railway embankments on the river flats, carried away the silt in the river bottom to such a depth that the bridges frequently collapsed, so that it was found necessary to carry the piers down to great depths, if rock were not encountered. He has, therefore, advised that this downward-scouring property of rapidly flowing water be employed by constructing a culvert with sides and top that would allow of the sand being blown over it without blocking the waterway, but with no bottom. This culvert could be made large enough to maintain some scour in the river, and, having no bottom, whenever the current became rapid the stream would carry off the sand from the bottom, allowing the accumulation at the sides to be undermined and carried off, thus enlarging the gap in the bar and allowing the pent-up waters to rush through; the culvert being left standing on its supporting piles ready to function again the next time the drifting wind-blown sands tried to close the river mouth.

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